Development of DEM–CFD Simulation of Combustion Flow in Incinerator with the Representative Particle Model

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Keywords: Incinerator, DEM–CFD Simulation, Combustion, Waste

ABSTRACT

A simulation code based on the discrete element method (DEM) and computational fluid dynamics (CFD) coupling model was developed to simulate the behavior of radioactive cesium in waste incinerators. The waste lump was represented by particles in the simulation. The energy equation for a mixed gas, diffusion equation for each gas component, as well as the energy, drying, pyrolysis, and combustion equations for each particle were solved in the simulation by adding a combustion model to the standard DEM–CFD coupling model. The particle size of the waste changed as drying, pyrolysis, and combustion progressed. At the end of the combustion process, particle waste became ash, and the number of ash particles was enormous. To avoid an excessive computational load due to the high particle number, a similar assembly model was adopted to reduce the particle number in the calculation. There was a good agreement between the simula- tion and experimental results for the temperature at the outlet of the furnace and the flue gas composition.